PROJECT facts

U.S. Department of Energy
Office of Fossil Energy
National Energy Technology Laboratory

Sequestration

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Carbon Dioxide Capture from Flue Gas Using Dry Regenerable Sorbents

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Background

Currently available commercial processes to remove CO_2 from waste gas streams are costly. Research Triangle Institute, working with Church and Dwight, Inc., is developing an innovative process for CO_2 capture that employs a dry, regenerable sorbent. The process is cyclic in that the sorbent first captures the CO_2, is regenerated to yield a concentrated stream of CO_2, and then recycled to the absorption/adsorption step. Although, the proposed process can be used to remove CO_2 from flue gas, it can also be used to capture CO_2 from gasification streams at high temperature.

Sorbents being investigated, primarily alkali carbonates, are converted to bicarbonates through reaction of carbon dioxide and water vapor. Sorbent regeneration produces a gas stream containing only CO_2 and water. The water may be separated out by condensation to produce a pure CO_2 stream for subsequent use or sequestration.

Primary Project Goal

The goal of this project is to develop a simple, inexpensive process to separate CO_2 as an essentially pure stream from a fossil fuel combustion system using a regenerable sorbent.

Objectives

To develop a technology that is

- Applicable to both coal and natural gas-based power plants.
- Applicable as a retrofit to existing plants, as well as to new power plants.
- Compatible with the operating conditions in current power plant configurations.
- Able to handle flue gas containing contaminants such as SO_2, HCl, particles, and possibly heavy metals, such as Hg.
- Relatively simple to operate.
- Significantly cheaper than currently available technologies.

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PROJECT PARTNERS

RTI

Church and Dwight, Inc.

Louisiana State University

COST

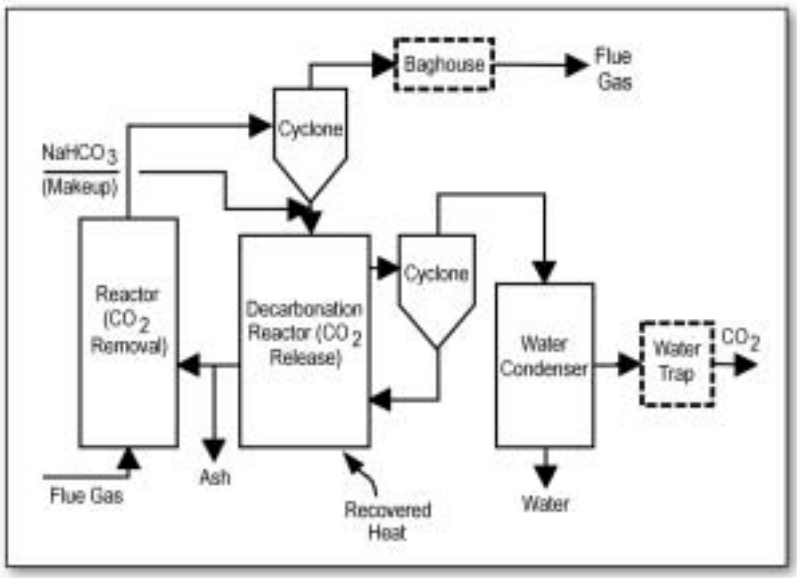
Total Project Value:	$1,050,889
DOE:	$ 812,285
Non-DOE Share:	$ 238,604

Accomplishments

The sorbent material has been well characterized and analyzed for chemical composition. Testing has confirmed that the reaction rate and achievable CO_2 capacity of sodium carbonate decreases with increasing temperature and that the global rate of reaction of sodium carbonate to sodium bicarbonate increases with an increase in both CO_2 and H_2O concentrations. It has been shown that capture of 25% of the CO_2 will not require any additional power. Future efforts will be aimed at optimizing the process to capture additional CO_2 without requiring additional power.

Benefits

This technology will provide conventional pulverized-coal fired power plants, natural gas-fired combined cycle plants, and advanced power generation systems with a less costly process to remove CO_2 from the flue gas. The ability to operate a CO_2 removal system at higher temperatures is more efficient that low temperature systems.



Conceptual Transport Reactor System

This configuration is an attractive treatment option for flue gas from power plants employing wet FGD and for flue gas from natural gas-fired systems.